Trigonometry Workbook

Trig identities

krista king MATH

EVEN-ODD IDENTITIES

1. Find trig function has the largest value at $\theta = -\pi/3$?

$\sin\left(-\frac{\pi}{3}\right)$ $\cot\left(-\frac{\pi}{3}\right)$

$\cos\left(-\frac{\pi}{3}\right)$ $\sec\left(-\frac{\pi}{3}\right)$

$\tan\left(-\frac{\pi}{3}\right)$ $\csc\left(-\frac{\pi}{3}\right)$

2. Evaluate the expression.

$$\sec(-45^\circ) \cdot \csc(-45^\circ) \cdot \tan(-45^\circ) \cdot \cot(-45^\circ)$$

3. Solve the equation and write the solution in set notation.

$$\sin(-x) + \cos(-x) = 0$$

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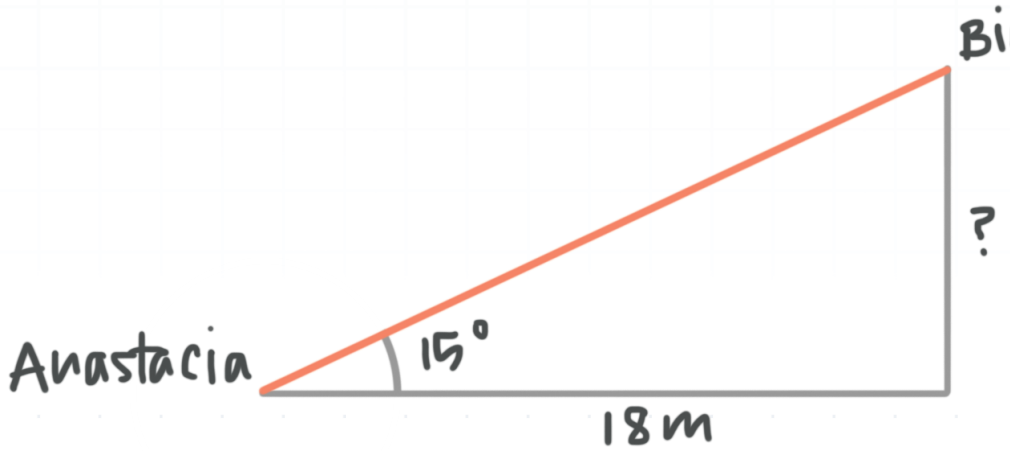
SUM-DIFFERENCE IDENTITIES

■ 1. Evaluate the expression.

$$\cos \frac{7\pi}{12}$$

■ 2. Anastacia is watching a bird on a tree. She measured the angle of elevation of the bird as $15°$, and the distance to the tree as 18 meters. Find the exact altitude of the bird above the ground.



■ 3. Solve the equation.

$$\sin x + \sqrt{3} \cos x = \sqrt{2}$$

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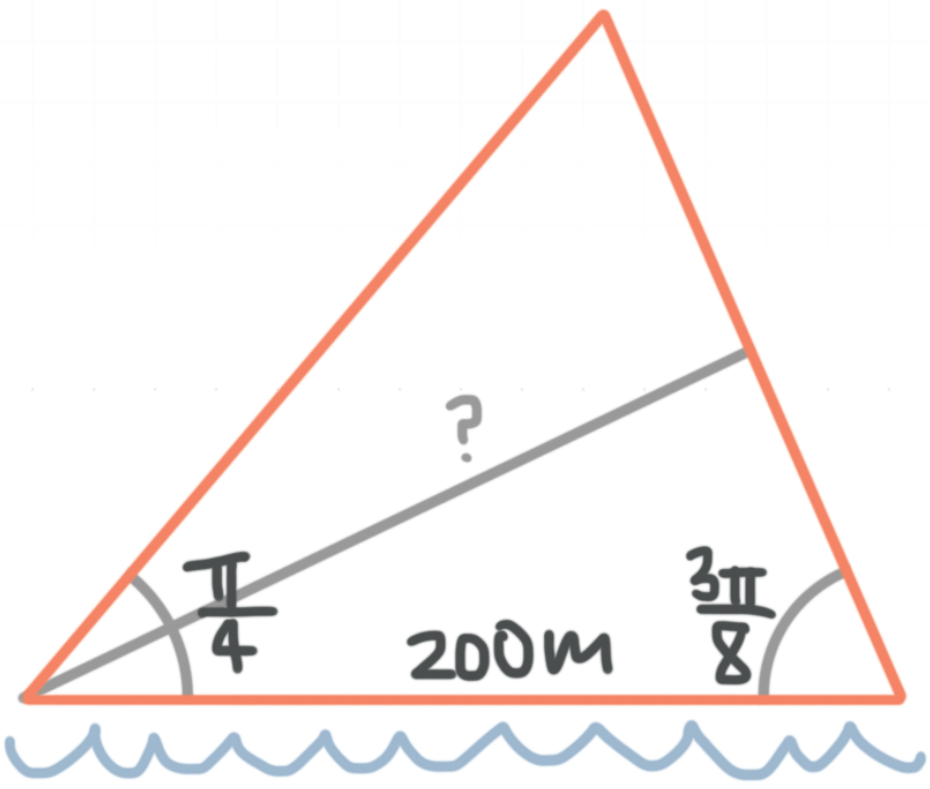
HALF-ANGLE IDENTITIES

■ 1. Use half-angle identities to find the exact value.

$$\tan 67.5^\circ$$

■ 2. A triangular-shaped plot of land has a side 200 meters long that's adjacent to a river. The angles adjacent to that side are $\alpha = \pi/4$ and $\beta = 3\pi/8$. Find the exact length of a fence that divides the plot into two equal parts and bisects α.



■ 3. Simplify the expression for the angle t that lies in the second quadrant.

$$\sin\frac{t}{2}\cos\frac{t}{2}$$

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DOUBLE-ANGLE IDENTITIES

1. Simplify the expression.

$$\cos^4\theta - \sin^4\theta$$

2. Find the exact value of the expression.

$$4\cos 75^\circ \cos 15^\circ$$

3. Sketch the graph of $f(x)$.

$$f(x) = 4\sin x \sin(90^\circ - x) + 1$$

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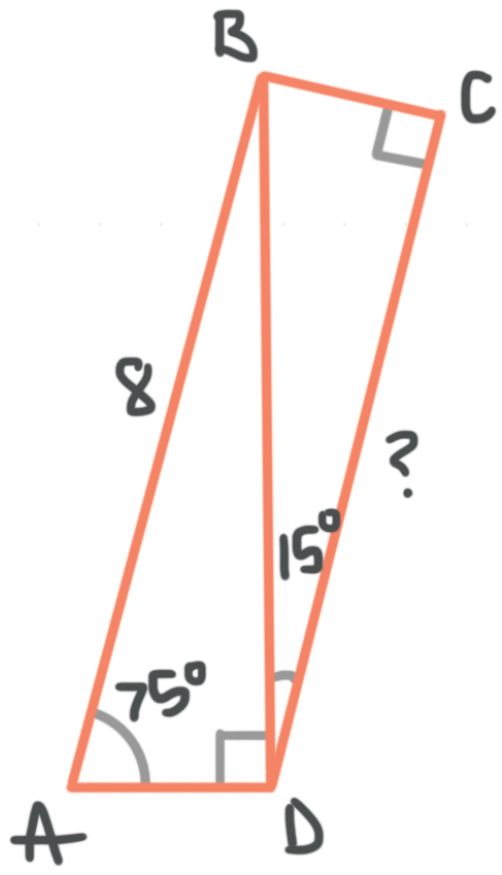
PRODUCT-TO-SUM IDENTITIES

1. Rewrite $\sin^3 x$ as an expression in terms of only first-degree sine functions.

2. Sketch the graph of the function $f(x)$.

$$f(x) = 4\cos\left(x - \frac{\pi}{4}\right)\cos\left(x + \frac{\pi}{4}\right)$$

3. In quadrilateral $ABCD$, find the exact length of CD.



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SUM-TO-PRODUCT IDENTITIES

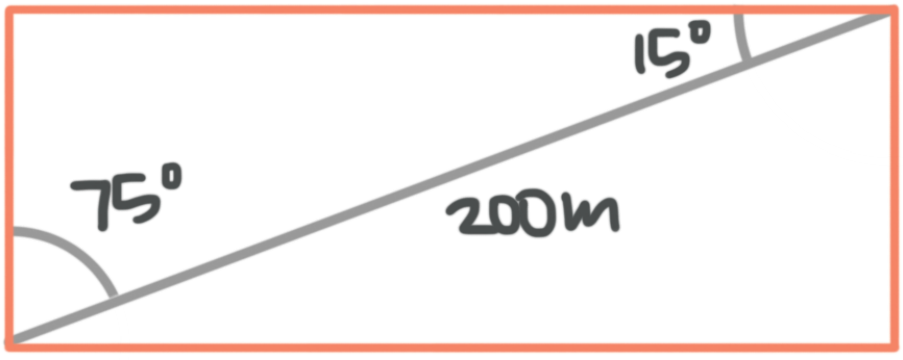
1. Sketch the graph of $f(x)$.

$$f(x) = \sin\left(x + \frac{\pi}{6}\right) - \sin\left(x - \frac{\pi}{6}\right)$$

2. Solve the equation.

$$\cos\left(x + \frac{3\pi}{4}\right) = \cos\left(\frac{3\pi}{4} - x\right)$$

3. A rectangular plot of land has a diagonal that's 200 meters long and creates interior angles $15°$ and $75°$ on the same side of the diagonal. If the owner wants to build a fence around the entire plot, find the length of the fence.



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USING TRIG IDENTITIES TO PROVE THE EQUATION

1. Prove the trig identity.

$$\tan\frac{x}{2} = \frac{1-\cos x}{\sin x}$$

2. Prove the trigonometric identity.

$$\frac{\sin 5x - \sin x}{\cos 5x + \cos x} = \tan 2x$$

3. Prove the trigonometric identity.

$$\sin(x-\pi)\sin(x+\pi) = \sin^2 x$$

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LISTING THE SOLUTIONS IN THE INTERVAL

1. Maggie rides a ferris wheel at a carnival. The altitude $h(t)$ of Maggie's cabin above the ground is modeled by $h(t)$ when $t \geq 0$ where t is time in minutes. Find all values of t when Maggie's cabin is at the bottom of the wheel.

$$h(t) = 16 - 15 \sin\left(\pi t + \frac{\pi}{2}\right)$$

2. A ball is bouncing on a flat surface. Within the time interval $t \in [0,4]$, the height of each bounce is equal, and the altitude $h(t)$ of the ball's position above the surface is given by $h(t)$, when $0 \leq t \leq 4$ where t is time in seconds. Find all values of t when the ball reaches its highest altitude.

$$h(t) = 3 + 3\cos(3t)$$

3. Solve the equation.

$$\cos^2 x - 3\cos x + 2 = 0$$

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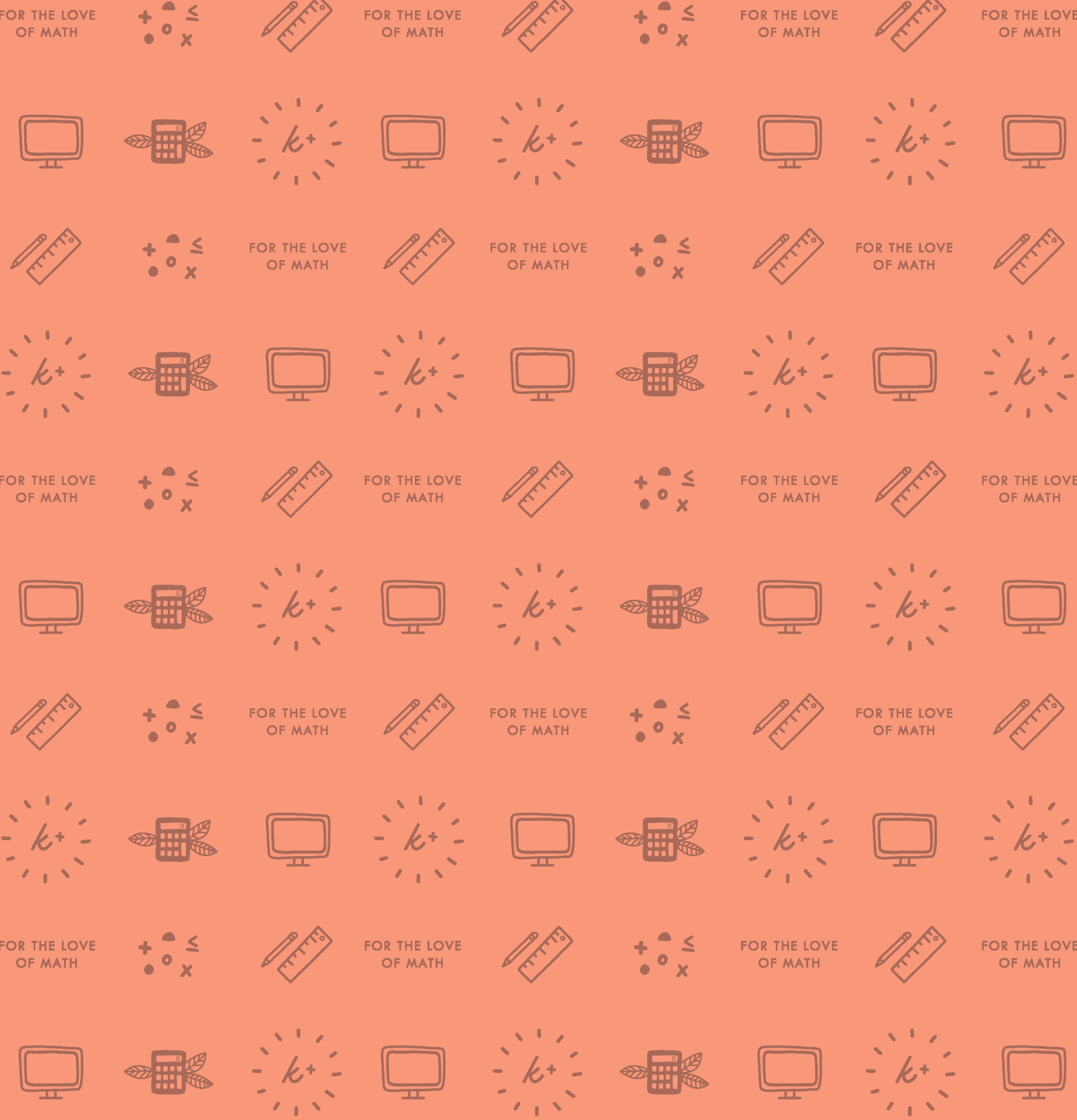

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